Ontario Department of Agriculture

ONTARIO AGRICULTURAL COLLEGE

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MUSHROOMS OF ONTARIO

By

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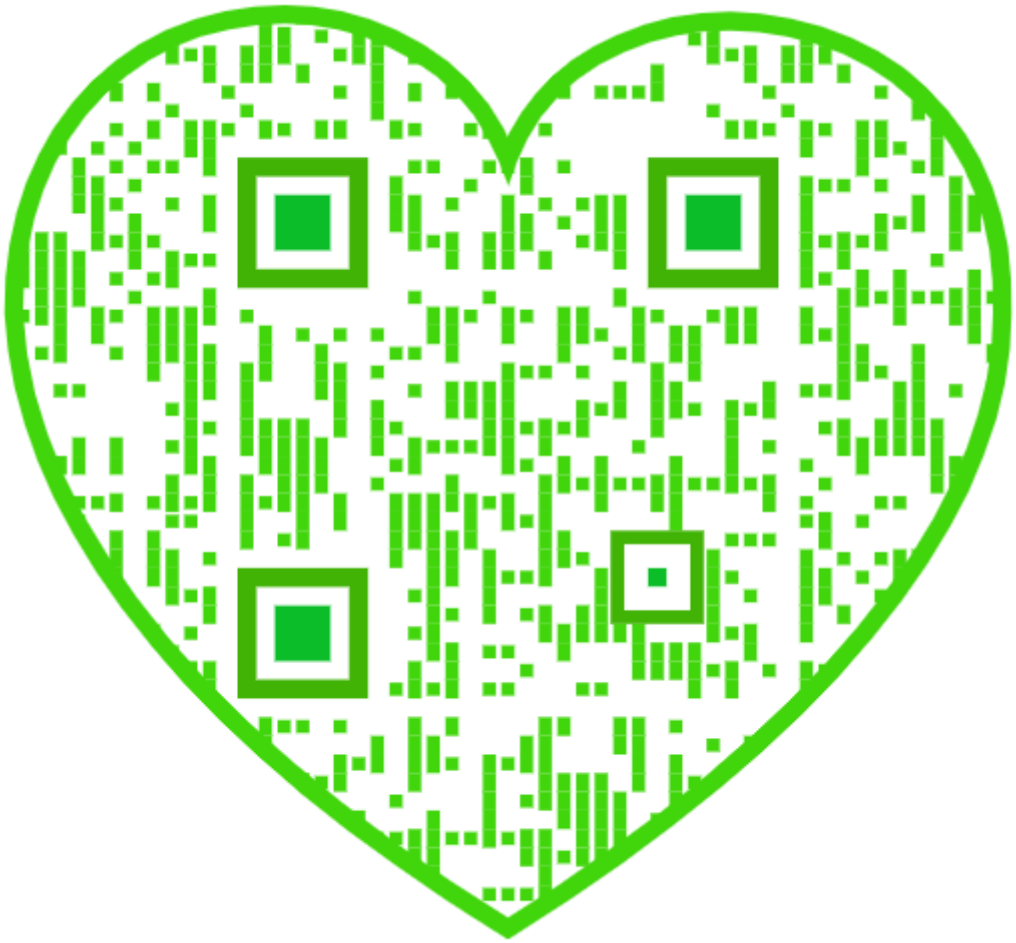

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Common Edible and Poisonous Mushrooms of Ontario

By R. E. STONE, Ph.D.

INTRODUCTION.

At the present time when the world is threatened with a shortage of food, it becomes necessary to utilize all our food resources. We are advised to use more corn, to grow and consume more vegetables and fruit and to have smaller portions of food served. All this will help, but we should also see to it that all possible sources of food are utilized. At the present time there is in Ontario a supply of food going to waste which should form an important addition to our diet. Every year thousands of tons of mushrooms are allowed to decay. These plants are extensively utilized in European countries not only by the wealthy but also by the poorer classes. In this country few people gather wild mushrooms and such high prices are charged for the cultivated kind that they cannot be used except occasionally as a luxury.

FOOD VALUE OF MUSHROOMS.

The food value of mushrooms is not as great as that of many of our staple foods such as meat, wheat, flour or beans, but it is about equivalent to that of our fresh vegetables. In addition, they give distinct and pleasing flavours to other food, and by furnishing the needed variety to our diet they become valuable as food accessories also. Further, if one knows wild mushrooms this extra food and food accessories also. Further, if one knows wild mushrooms this extra food and luxury may be had at the expense of a few minutes walk on a cool morning or a trip to the woods or parks on a holiday.

During the past year numerous articles have appeared in newspapers and elsewhere advocating the use of wild mushrooms for food. From these articles one might be led to suppose that they had a very high food value, *i.e.*, "twice that of fresh vegetables or half that of lean meat." A careful examination of the chemical analyses of many species shows that mushrooms vary considerably in composition but in general are 90 per cent. water and 10 per cent. solid matter. In fact their composition resembles very closely that of turnips or cabbage. They are not "animal-like" in their nature as one might suppose from the popular statement that mushrooms are "vegetable beefsteak." A glance at the following table will show the food value of some common kinds compared with some of our staple foods:

NUTRITIVE VALUE OF TEN POUNDS OF SEVERAL FOODS*

		Proteids.	Fats.	Carbo-hydrates.	Calories.
a	Beef (round)	1.87	.88	....	7,200
	Beans (dried)	2.23	.18	5.91	15, 41
b.	Cabbage	.18	.03	.19	1,400
	Potatoes	.18	.01	1.53	3,250
	Flour (roller process)	1.13	.11	7.16	16,450
c.	Shaggy Mane (*Coprinus comatus*)	.01	.025	.134	987
	Oyster Agaric (*Pleurotus ostreatus*)	.051	.012	.828	1,811
	Morel (*Morchella esculenta*)	.091	.05	.506	955
	Common Cultivated Mushroom (*Agaricus campestris*)	.18	.03	.46	1,316
	Oysters	.61	.14	.33	2,350

*Atkinson, Geo. F.—Mushrooms, Edible, Poisonous, Etc.

What Mushrooms Are.

All of us are acquainted with green plants such as trees, flowers and grass, and when we think of plants it is these which we have in mind. But there are other plants which are not green and which do not produce flowers or seeds, and are often more or less inconspicuous. They are associated with the spoiling and decay of food, wood, etc. When a piece of bread is left in a warm, moist place, it soon becomes covered with blue or black mold. This mold is a plant belonging to a class of plants known as fungi. In like manner wood, straw or leaves if kept moist, are soon covered with a growth of fungi which may form large, woody or fleshy masses.

The term mushroom is used to mean these large, woody or fleshy fungi. They may be seen growing on the trunks of trees, on stumps, or fallen logs, coming out of the leaf mold on the forest floor, or in the grass in yards, lawns, fields and pastures or along the roadside. The plants may look like round balls, or shelves or brackets, or caps supported on slender stems, or branched and coral-like. In color they may vary from white through pink, red, yellow, blue, brown to nearly black, but never grass green.

It is seldom that we see the entire plant. The part we usually see is the fruiting body, which compares to the whole plant much as an apple to an apple tree. The feeding part, called the spawn or mycelium, consists of fine white or colored threads running all through the material upon which the plant is growing.

Parts of a Mushroom.

In order to understand the structure of the mushroom let us examine the common cultivated kind. (Fig. 1).

What we commonly call a "mushroom" is the fruit body of a fungus grow-

ing in decaying organic matter such as old leaves, straw or rotting stable refuse. This fruit body consists of a fleshy cap or pileus two or three inches in diameter supported on a stalk or stipe which comes up out of the ground. This stalk is three or four inches long and one-half inch thick and quite solid. On the under side of the cap are the gills or lamellæ. These are thin plates standing on edge and radiating out from the stalk like the spokes of a wheel. In a young fruit, called a button, these gills are protected by a curtain or veil which stretches from the stalk to the edge of the cap. As the cap expands the veil is torn apart, a little of it remaining as a ragged fringe on the edge of the cap but most of it remaining as a ring or annulus on the stalk.

In some of the wild mushrooms the stalk may be absent, the cap being attached by one side to logs or stumps on which the fungus is growing. In a few forms, especially in some poisonous plants, there is at the base of the stalk a large, shaggy or scaly bulb or a distinct cup called the poison cup or volva.

Fig. 1. Common or Cultivated Mushroom. Edible. Natural Size (Original).

How Mushrooms Grow.

Mushrooms are flowerless plants without leaf green (chlorophyll). Since they have no flowers they have no seed, but reproduce by means of minute bodies called spores, which are formed on the gills. As they have no leaf green (chlorophyll) they cannot make their own food as the green plants do, so they depend upon the food made by other plants or upon animals. Some get their food from living plants and animals; they are robbers (parasites). Others live on the dead decaying remains of other plants or animals, and are scavengers (saprophytes).

When the "mushroom" or fruit body is ripe the spores are shed and are blown away by the wind. If the spores settle in a favorable place, warm, moist and with food present, they sprout or germinate. Finally they form many fine white or colored threads which spread all through the material which can furnish food. These fine threads are the spawn or mycelium. As the spawn grows it gives off substances called enzymes, which digest the wood, old leaves, straw or manure in which the fungus is growing. As the material is digested it is absorbed by the spawn and used as food. The substance upon which the fungus is feeding gradually breaks down, that is it decays and disappears.

The spawn may grow a long time before it fruits. Even in the cultivated mushroom, when conditions for growth are made as favorable as possible, it is

usually six weeks from the time the spawn is planted until the "mushrooms" appear.

When the spawn has gathered sufficient food it then begins to form the fruit bodies or "mushrooms." (See Fig. 2). These at first are tiny white balls, smaller than a pin head. They grow rapidly in size, and when they are as large as a small marble one can recognize the main parts. In the top will be the cap, with the gills underneath, protected by the veil, while the lower part is the stalk or scape. When the parts have all been formed the "mushroom" enlarges rapidly and pushes up out of the ground. Very frequently the stalk elongates so rapidly when the fruit body is nearly grown that the cap may be pushed up out of the ground during the night, so that some people have thought that these mushrooms grow in a night.

When and Where to Look for Mushrooms

Mushrooms may be found from the time the ground thaws out in the spring until it freezes up in the fall. They are most plentiful after prolonged wet weather or after warm rains when the days are warm and the nights fairly cool and damp.

Fig. 2. Button Stage of Common or Cultivated Mushroom. Natural Size (Original).

It is best to look for them on cool, dewy mornings, a day or two after warm, heavy rains.

They grow any place where there is plenty of decaying vegetable or animal material which is not too much disturbed by cultivation. Some kinds grow in rich, well manured lawns, others in pastures, several varieties along the roadside. Some delicious kinds grow in barnyards. Many grow best in the woods, some in the leaf mold on the forest floor, some on stumps, some on fallen logs and a few on standing trees.

To Know Wild Mushrooms.

There are in Ontario at least 150 kinds of fleshy fungi, which are large enough to attract the attention of a person collecting mushrooms for table use. However, not all of these can be used, as some of them are poisonous. Four of these are deadly poisonous and four are reputed mildly poisonous and a few, which occur only occasionally, have unknown properties.

When one is gathering mushrooms one of the first questions he is asked is, "How do you tell mushrooms from toad stools?" This question implies that the inquirer thinks of mushrooms as edible and "toad stools" as poisonous. This

question may be answered by saying that mushrooms and toad stools are the same. There is no sharp line of distinction, and no simple test which can be applied to distinguish the edible from poisonous forms. The so-called peeling test is useless, as one of our most poisonous forms peels as readily as the cultivated mushroom. The blackening of silver was at one time supposed to show that mushrooms were poisonous, but this test is of no value, as the blackening of silver only indicates the presence of sulphur or its compounds, and has no relation to poisons present. Some people say, "Collect only those mushrooms which grow in fields and pastures." Unfortunately, our deadly poisonous mushrooms, although generally growing in the woods, sometimes grow in lawns and pastures. On the other hand, if one does not gather mushrooms in the woods and parks many of the very best kinds will be missed.

The only way to be sure that the mushrooms gathered are wholesome is to learn to know the mushrooms from their characters the same as we learn to know other plants. When one goes out to gather berries he must distinguish between nightshade and strawberries or between elderberries and spikenard. Some ones to know the edible ones and to recognize those that are not edible, and [illegible] the latter alone. In the same manner one must learn to distinguish the mushrooms. This may be done by going out with someone who is familiar with mushrooms and has gathered them for use many times, or one may learn to know mushrooms by gathering the different kinds and carefully comparing them with descriptions and pictures. This method is, perhaps, the one which many will have to use.

In order that more people may learn to know some mushrooms and thus utilize part of the food that is being wasted, the most common edible kinds and also the poisonous ones that are likely to be found in Ontario are described and photographs of them are shown.

There is still another way to learn mushrooms. The Department of Botany of this College will be very glad to identify any mushrooms sent in for this purpose. In order to have them identified they should be prepared as follows:

Carefully dig up the mushrooms so that all the fruit body, including the very base of the stalk, is present. Wrap in dry paper, taking care not to crush the specimens. A note should be attached which describes where the plants grew, whether in fields, or woods, or on the roadside, whether it grows in the ground or on wood, and finally the color of the plant when fresh condition. They should then be enclosed in a strong cardboard box or tin can to protect them from being crushed, and addressed to

DEPARTMENT OF BOTANY,

ONTARIO AGRICULTURAL COLLEGE,

GUELPH, ONT.

EDIBLE MUSHROOMS.

Common Mushroom, Cultivated Mushroom (*Agaricus campestris*, Linn.). Edible.

This is the mushroom commonly cultivated. (Fig. 1.) It also grows wild, and may be found in lawns, meadows, pastures, cultivated fields, greenhouses, and is very common on well-cared-for golf links. It may be found from late spring until fall, but is more abundant in summer and early autumn, when nights are cool and the days warm and not too dry.

The cap 2 to 4 inches wide, at first hemispherical, later becoming flat; white or with brown threads over the surface, giving a greyish or brownish silky appearance; flesh solid and white. The stalk or stripe is 2 to 4 inches long, $\frac{1}{2}$ to $\frac{3}{4}$ of

Fig. 3. Scaly or Forest Mushroom. Edible. Natural Size (Original).

an inch thick, firm, colored like the cap. The gills are free from the stalk at the inner end; at first pink, later becoming purple brown or nearly black. The gills are at first hidden by the veil which later is torn apart, leaving a fringe on the edge of the cap and a small ring on the stalk.

Field Mushroom or Horse Mushroom (*Agaricus arvensis*, Schaff.). Edible.

Grows in fields and meadows.

This is very much like the common mushroom, except that the stalk is longer and becomes hollow in age and the veil is thicker, so that the ring or annulus may appear double. The gills are at first pink, then turning brown. Some spawn companies claim to have the "spawn" of this species for sale.

Rodman's Mushroom (*Agaricus rodmani*, Pk.). Edible.

This mushroom occurs very commonly in cities and towns, on lawns and boulevards. The plant is entirely white with tinges of yellow. It is about the same size as the common mushroom, but the stalk is very short and solid. The veil is quite thick and forms a distinct double ring or annulus. The gills are at first pink, then dark brown. Some seed companies claim to have the "spawn" of this species for sale.

Scaly or Forest Mushroom (*Agaricus placomyces*, Pk.). Edible.

This mushroom grows in woods or borders of woods, coming up from the fallen leaves. (Fig. 3.) It most frequently occurs where there are some hemlock or pine trees. It may be found from June to September.

The cap is 2 to 5 inches in diameter, at first rounded, finally nearly flat, but thicker in the centre. It is first brown, but as the cap expands the brown surface

Fig. 1.—Smooth or White Mushroom. Edible. Natural Size (after Atkinson).

breaks up into numerous small scales exposing the white flesh below. The stalk is 2 to 5 inches long, ¼ to ½ of an inch in diameter, white, slightly bulbous at the lower end, often becoming hollow. The gills are free from the stalk, at first white, but very soon becoming pink and finally dark brown. The veil is thick, so that a large prominent ring is formed which sometimes appears double.

White Mushroom or Smooth Mushroom (*Lepiota naucina*, Fr.). Edible.

This mushroom grows in lawns, pastures and along roadsides, and is most abundant in September and early in October. (Fig. 1.) The plant is entirely white or in old specimens somewhat buff.

The cap is 2 to 4 inches broad, globose to hemispheric, entirely white or slightly tinged with buff and smooth. The stalk is 1½ to 3 inches long, ¼ to ½ an inch thick, often hollow, white and generally with a *smooth* bulb at the base. The gills are free from the stalk, white or a dirty pink in old specimens.

The veil at first hides the gills, later the veil breaks away from the edge of the cap and forms a ring on the stalk. The ring often fits loosely to the stalk and may be slipped up and down.

CAUTION. Although this mushroom is very good, care must be taken to distinguish it from some deadly poisonous plants which sometimes grow in the same situations. The white mushroom described here, although white is not shiny, is dry, not slimy or viscid, and has a smooth bulb at the base of the stalk, not a shaggy bulb or cup.

PARASOL MUSHROOM (*Lepiota procera*, Scop.). EDIBLE.

This is one of our striking mushrooms, and is not inappropriately named. (Fig. 5.) It grows in pastures, lawns, gardens, along roadsides, and in open woods in late summer and early autumn.

Fig. 5.—Parasol Mushroom. Edible. Natural Size (after Massee).

Fig. 6.—Shaggy Mane. Edible. Natural Size (Original).

The cap is at first bell shaped, later becoming parasol shaped. It is 2 to 5 inches in diameter, at first greyish or brownish red, but as the cap expands the colored surface breaks up into scales, showing the white flesh underneath. Finally the cap becomes shaggy in appearance.

The stalk is 4 to 8 inches long, $\frac{1}{6}$ to $\frac{1}{4}$ of an inch in diameter, the same color as the cap, and generally becomes hollow in age.

The gills are white, free from the stem, and closely crowded.

The ring is stout, narrow, and usually quite free from the stem, so that it may be moved up and down.

Shaggy Mane (*Coprinus comatus*, Fr.). Edible.

The Shaggy Mane is one of the most prized mushrooms by those who know it. (Fig. 6.) The plant is quite large and distinguished by its shaggy cap, which melts down, forming inky liquid as the plants become old. It occurs in lawns and other grassy places, especially in richly-manured ground. The plants sometimes occur singly or a few together, but often quite large numbers of them appear in a small area. They occur most abundantly during quite wet weather, or after heavy rains, in late spring or early autumn, sometimes in summer.

The cap is cylindrical, usually brownish at first, but the surface becomes broken up, forming shaggy scales and exposing the white flesh underneath. The cap is 4 to 7 inches long, 2 inches thick. As the plant becomes old the cap melts down into an inky liquid and wastes away.

The stalk is white, 6 to 9 inches long, thickened at the base and hollow.

The gills are at first white, then pink, changing to brown, finally becoming black and melting down into an inky liquid.

There is a ring in young specimens, but this usually disappears.

Fig. 7. Ink Cap. Edible. Natural Size (after Atkinson).

Since the cap and gills turn into an inky liquid the plants should be gathered early in the morning before the cap and gills have begun to change color or when the gills near the edge are flesh color. It may be also eaten later the gills become black, but the inky looking mass is not inviting.

Ink Cap (*Coprinus atramentarius*, (Bull.) Fr.). Edible.

The ink cap occurs in much the same places as the shaggy mane and is sometimes found accompanying it, but is usually more common and abundant. (Fig. 7.) Sometimes the plants are scattered, but usually there are ten or twenty in a dense cluster.

The cap is egg-shaped or oval, generally smooth or somewhat scaly, 2 to 3 inches long, silvery grey, or ashen grey, or smoky brown. At maturity the cap melts down into an inky liquid.

The stalk is 3 to 4 inches long, ½ an inch thick, hollow, the same color as the cap, or in some a little lighter in color. There is no distinct ring, but an irregular raised ridge about the stalk at the bottom of the cap.

The gills are packed very close together; at first whitish, soon becoming pink, then moist and black, and dropping away as an inky liquid.

Like the Shaggy Mane, this mushroom must be gathered early if one is to enjoy them, as on warm days the cap may be entirely gone by noon, but if they are gathered early and kept in a cool, dry place, they may be preserved for a few hours.

Mica Cap (*Coprinus micaceus*, (Bull.) Fr.). Edible.

This little mushroom is generally very abundant in late spring and early summer, and sometimes in the autumn. (Fig. 8.) It grows about the bases of stumps

Fig. 8.—Mica Cap. Edible. Natural Size (Original).

or trees, or from wood buried in the soil. It forms in dense tufts of ten to thirty, sometimes several hundred coming up from the roots of a dead tree or stump, forming large masses in the lawn or boulevard. It is sometimes found on logs in the woods.

The plant gets its name from the numerous glistening scales on the cap, causing it to appear as if powdered with mica.

The cap is oval, then bell shaped, with fine lines from the centre to the edge. When young it is covered with glistening mica-like scales. The color is tan, light buff or tawny yellow. The cap is 1 to 2 inches broad.

The stalk is slender, smooth, white, hollow, 1 to 3 inches long.

The gills are at first white, finally becoming black.

In wet weather the cap and gills melt down into an inky liquid, but may simply dry up at other times.

White Oyster Mushroom (*Pleurotus ostreatus*, Jacq.). Edible.

This mushroom is so named because the white, one sided caps resemble, to some extent, oysters. (Fig. 9.) The plant grows on dead logs and stumps in dense clusters, the caps overlapping each other. It occurs in late summer and autumn.

The cap is one sided, with a very short, solid stalk or none, 2 to 8 inches wide, white or greyish, thick and fleshy.

The stalk is at one side short, thick, solid, or absent.

The gills are white, running down the stalk.

Dark Oyster Mushroom (*Pleurotus serotinus*, Schrad.). Edible.

This mushroom resembles the preceding one, but is darker in color. It also grows on logs and stumps, either occurring singly or in small, overlapping clusters. It is common in damp woods in the autumn.

Fig. 9.—White Oyster Mushroom. Edible. Natural Size (Original).

Fig. 10. — Fawn Cap. Edible. 2/3 Natural Size (Original).

The cap is attached by one side, 2 to 5 inches wide, sometimes yellow, but more often greenish brown or with an olive tinge. The flesh under the "skin" or pellicle is white or whitish.

The stalk is very short or none.

The gills are white or with a yellowish tinge.

In cooking this mushroom it is best to remove the dark skin or pellicle, as it improves the appearance of the food, although it does not improve the flavor.

Fawn Cap (*Pluteus cervinus*, Schaeff.). Edible.

This mushroom occurs in mixed woods, on and around old stumps. (Fig. 10.) It appears after damp weather in early spring and autumn.

The cap is light brown or fawn colored, streaked with darker brown; surface dry and shining; slightly hairy; 3 to 5 inches broad.

The stalk is creamy white streaked with brown, 3 to 6 inches long.

The gills are almost white when young, but soon become flesh color, free from the stalk.

There is no ring.

ORANGE FLOW (*Lactarius deliciosus*, (L.), Fr.). EDIBLE.

This mushroom occurs abundantly in balsam and spruce woods in the autumn. (Fig. 11.) When broken the flesh gives out an orange-colored juice. The plants have a pleasing sweet odor.

The cap is 3 to 5 inches broad, funnel shaped, yellow or pale orange with bands of lighter color; slightly hairy; juice or milk orange colored.

The stalk is 2 to 3 inches long, about an inch thick, hollow and brittle.

The gills are yellow or orange, running down on the stem.

There is no ring.

CORAL FUNGUS OR FAIRY CLUB (*Clavaria flava*, Schæff.). EDIBLE.

This fungus occurs commonly in the woods, growing on stumps and rotting logs, and is most abundant after warm, wet weather in late summer and early autumn. (Fig. 12.)

The plant is 3 to 6 inches high and 2 to 4 inches broad. At the base it is thick and fleshy, but the upper half is divided into numerous, upright, pale yellow

Fig. 11.—Orange Flow. Edible. 2/3 Natural Size (Original).

branches, whose tips are more deeply colored. Usually when the plant becomes old it fades out to nearly white. The flesh is firm, white and solid.

There are some kinds of coral fungi which are always pure white, as well as some in which the branches are tipped with red. There are also a few kinds that do not branch, but are firm, upright and club shaped.

All of these coral fungi and Fairy Clubs are edible, and there is no danger in collecting them for the table.

HEDGE HOG FUNGUS (*Hydnum erinaceus*, Bull.). EDIBLE.

This fungus occurs on stumps and logs in the woods, and is often found growing from wounds on living trees in the fall. (Fig. 13).

It forms large, white masses, with long, slender, downward hanging spines.

In some cases the mass may be much branched, or in a few forms the plant may be shaped like a mushroom with a cap and stalk, but with spines in place of gills.

Fig. 12.—Coral Fungus. Edible. Natural Size (Original).

Fig. 13.—Hedge Hog Fungus. Edible. Natural Size (Original).

GIANT PUFF BALL (*Lycoperdon giganteum*, Batsch.). EDIBLE.

This fungus sometimes occurs abundantly in pastures and on roadsides in August and September. (Fig. 14.) The fruit body is very large, usually 8 to 15 inches in diameter or even larger. In 1915 a report was received by this Department of six of these puff balls weighing 18 pounds, two just as large and a dozen smaller ones, all found on a piece of ground but 2 rods square. There are reports of these puff balls which were over three feet in diameter and weighed 17 pounds.

The fruit body is flattened ball shaped. It is at first pure white and quite smooth. Later it becomes light yellowish brown, and then cracks into many fine areas. When young the interior of the ball is white and cheesy, but when it becomes old it breaks up into a yellowish or snuff-colored powdery mass.

The puff balls should be gathered while still white inside.

If one succeeds in finding a single one of these balls he is assured of having several mushroom feasts.

Fig. 14.—Giant Puff Ball. Edible. 1/4 Natural Size (Original).

Fig. 15.—Common Morel. Edible. 1/2 Natural Size (Original).

PEAR-SHAPED PUFF BALL (*Lycoperdon pyriforme*, Schaeff.). EDIBLE.

This is a much smaller fungus, the ball being only 1 to 2 inches high. It grows on old timber or on the ground, but the balls occur in great numbers, sometimes forming dense clusters several feet across. The fungus is excellent while still white inside. It is most commonly found in woods from July to October.

THE COMMON MOREL (*Morchella esculenta*, Pers.). EDIBLE.

This is one of the best of the few edible fungi which occur in abundance in the spring and early summer. (Fig. 15.) May and June are the usual months. They have the further advantage that there are no poisonous kinds closely resembling them. They are not very variable either in form or color. Both the cap and stalk are hollow, and the surface of the cap bears a number of prominent ridges joined together to form an irregular network. This distinguishes them from all

the other fungi except the "stink horns," which differ in having the long stalk arising from a cup partly buried in the soil and having a penetrating, disagreeable odor. Even the "stink horns" are edible when young.

There are four species of Morel, but as they are all edible no separate descriptions of them are given.

POISONOUS MUSHROOMS.

As previously stated, there are a few poisonous mushrooms. Some of these are deadly poisonous, and occur in considerable numbers. In this region the deadly poisonous kinds are all closely related, and a description of three common species will enable one to avoid all of them.

Fig. 16.—Fly Agaric. *Deadly Poisonous.* 1/2 Natural Size (Original).

Fly Agaric (*Amanita muscaria*, Linn.). Deadly Poisonous.

This fungus appears in July and August in groves and open woods or along roadsides near trees, usually preferring rather poor soil. (Fig. 16.) It is called "Fly Agaric," because an infusion of the plant was at one time used as a fly poison. The plant is typically large and handsome.

The cap is 3 to 5 inches broad, rounded when young, nearly flat when old, yellow or orange or even bright red in color, and covered with numerous angular scales, which are white or light yellow in color, and can easily be brushed off. As the cap becomes old it fades out, so that it may become nearly white and the scales may be washed off by rains.

The stalk is 4 to 6 inches long, about ½ an inch thick, usually white, but often yellowish in color, hollow in age. The bottom of the stalk is enlarged into a prominent bulb, which is more or less rough and shaggy or scaly. The lower part of the stalk above the bulb is also shaggy.

The gills are white or slightly tinged with yellow, and do not become pink or brown as do those of many edible mushrooms.

The ring is quite large, white, and firmly attached to the stalk.

The main points to remember about this fungus are: The yellow or orange cap with loose white scales. Gills white, never becoming pink or brown. Ring large, white, firmly attached to the stalk. *The stalk enlarged at the base into a prominent shaggy or scaly bulb and the stalk shaggy between the bulb and the ring.*

The poison in this mushroom is known as muscarin. This substance, fortunately has an unpleasant bitter taste, so that the plant is seldom eaten even if collected by mistake. The poison does not act immediately, but the symptoms appear in from ½ to 2 hours, and are: vomiting and diarrhœa, with a pronounced flow of saliva, suppression of urine, giddiness, uncertainty of movement, derangement of vision. This is followed by stupor, cold sweats and weakening of the heart action.

Fig. 17. Deadly Agaric, *Deadly Poisonous.* 1-2 Natural Size (Original).

Of course when symptoms such as these appear after eating mushrooms a physician should be sent for immediately.

The system should be freed of the undigested fungus as soon as possible. Strong emetics, such as zinc sulphate, apomorphine or warm mustard and water should be used. If these are lacking or produce no effect, tickle the throat with a feather or the finger to cause immediate and violent vomiting. This should be followed by strong dose of castor oil.

THE D[illegible] AGARIC (*Amanita phalloides*, Fr.). DEADLY POISONOUS.

This fungus is called the Deadly Agaric because it is extremely poisonous, and there is no known antidote for the poison. (Fig. 17.)

The plant usually grows in the woods or along the borders of woods, but has also been known to appear in lawns. It generally appears in July and August.

It is quite variable in color, varying from pure white through yellowish to olive. Some place the white forms in a different species.

The cap is 1.5 to 4 inches broad, at first bell shaped, finally nearly flat, fleshy, viscid or slimy when fresh, smooth, often with a few loose white scales. The color varies from white through yellow to olive green, the dark forms being more common in Ontario.

The stalk is 2 to 8 inches long, ½ to ¾ an inch thick, hollow, white or colored like the cap, but lighter in shade, becoming discolored on handling. It ends in an abrupt bulb which generally has a sharp rim standing up around it, forming a sort of cup, called poison cup or volva. This poison cup is usually deeply buried in the soil, so that in order to find it it is necessary to dig the plant up.

Gills white and remain white, never becoming pink or brown.

Fig. 18. Destroying Angel. *Deadly Poisonous.* Natural Size (after Atkinson).

Fig. 19. Young Stage of the Destroying Angel. *Deadly Poisonous.* Natural Size (Original).

The ring is white, prominent, and is high up on the stalk close to the cap. The ring is attached to the stalk, not loose as in the smooth white mushroom or parasol mushroom.

The poison in the Deadly Agaric is phallin. This poison, unfortunately, has no pronounced taste or odor, and gives no warning of its presence. Unfortunately, also, the symptoms of poisoning do not manifest themselves until 9 to 14 hours after the fungus is eaten. There is then considerable abdominal pain, and there may be cramps in the legs accompanied by convulsions and even lock-jaw and other tetanic spasms. The pulse is weak and abdominal pain is rapidly followed by vomiting and extreme diarrhoea, the intestinal discharges assuming the rice-water condition characteristic of cholera. These later symptoms persist, generally with-

out loss of consciousness, until death ensues, which happens in from two to four days.

There is no known antidote for phallin. The undigested portions of the fungus should be removed from the stomach and intestines by methods similar to those suggested under the Fly Agaric. If the poison already absorbed is not too great, it may wear itself out and the patient recover.

Of course when symptoms of poisoning appear a physician should be sent for immediately.

THE DESTROYING ANGEL (*Amanita verna*, Bull.). DEADLY POISONOUS.

This fungus is probably the cause of more cases of mushroom poisoning than any other. (Fig. 18.)

The plant is pretty, clean, pure white and attractive.

It usually occurs in the woods or near them, but may grow in lawns newly made from " rest soil. It is generally found in June and July.

The cap is 1.5 to 4 inches in diameter, at first bell shaped, later becoming nearly flat; *pure white, shining, viscid or slimy when fresh.*

Fig. 20. Scarlet Cap. *Mildly Poisonous.* About Natural Size (after Marshall.)

The stalk is 2 to 6 inches long, ¼ to ½ an inch thick, pure white, hollow in age. The stalk ends in an abrupt *bulb*, with a free border closely surrounding the base of the stalk and forming the poison cup or volva. This may be seen in even young specimens as shown by Fig. 19. This poison cup is buried in the soil, so that in order to see it it is usually necessary to dig the plant up. For this reason wild mushrooms growing in the soil should always be dug, not pulled up or broken off.

The gills are pure white and remain white, never becoming pink or brown.

The ring is broad and high up on the stalk, just under the cap. It is firmly attached to the stalk, and is not loose, as in the smooth, white mushroom.

Since this is our most poisonous mushroom its main characters should be thoroughly learned and remembered.

The cap is pure white, shining and slimy when fresh. The stalk is pure white, ending in a distinct poison cup or volva. Gills pure white and remain white. Ring white, broad, high upon the stalk to which it is firmly attached.

The poison in this fungus is the same as that in the Deadly Agaric, and the symptoms of poisoning and treatment are the same.

Scarlet Cap (*Russula emetica*, Fr.). Reputed to be Mildly Poisonous.

This fungus occurs very commonly in the woods from summer till autumn. It gets its name from the bright scarlet cap. (Fig. 30.) It is hot and peppery to the taste, and some report it to be mildly poisonous, while others say that it is edible.

The cap is 1.5 to 3 inches wide, thin, brittle, deep pink to rich red; furrowed near the edge, rounded when young, depressed in the centre when old.

The stalk is 2 to 3 inches long, white or tinged with yellow. Very brittle.

There is no ring and no volva or poison cup.

Besides the scarlet cap, some of the forms with milky juice are mildly poisonous. They are very hot and the milk is not reddish, as with the Orange Flow (*Lactarius deliciosus*), described under edible mushrooms.

There are some mushrooms which have tubes in place of gills. Some of these are edible and others poisonous. The poisonous ones have a flesh that changes color when cut or broken or have tubes with red mouths. There are a few mushrooms that have clay-colored gills and a cobwebby veil that should also be avoided.

Many mushrooms are wholesome when fresh, but become dangerous when they begin to decay, or show evidence of the work of insects or worms.

GATHERING WILD MUSHROOMS.

When one is gathering wild mushrooms a basket is the best receptacle for carrying them, as different compartments may be made for holding the various kinds and thus keep from crushing and spoiling the more tender ones.

When collecting mushrooms for the table they should never be pulled up or broken off. In the deadly poisonous mushrooms the most marked characteristic, the poison cup or volva, is deeply buried in the soil. If the plant is pulled up or broken off the poison cup is lost, and it is impossible to distinguish the poisonous kinds from certain edible ones. After a mushroom has been carefully dug up and examined and the collector is certain that it is edible, the lower part of the stalk may be cut off to get rid of the dirt. It is often very difficult to determine mushrooms from the young or button stage, so that unless buttons are accompanied by mature plants they should generally be avoided. In case of doubt the fungus should be discarded or the complete specimen shown to one who knows mushrooms very thoroughly.

Rules to be Observed in Gathering Wild Mushrooms.

It is impossible to give a simple rule or test for detecting poisonous mushrooms. Care must be taken to observe the characteristics of each mushroom gathered.

The following rules, if carefully followed, will enable one to avoid the poisonous forms:—

(1) Avoid fungi when in the button or unexpanded stage; also those in which the flesh has begun to decay, even if only slightly.

(2) Avoid all fungi which have stalks with a swollen base surrounded by a sac-like or scaly envelope, especially if the gills are white.

(3) Avoid fungi having a milky juice, unless the milk is reddish.

(4) Avoid fungi in which the cap is thin and very brittle, and in which the gills are nearly all of equal length, especially if the cap is bright colored.

(5) Avoid all tube-bearing fungi in which the flesh changes color when cut or broken, or where the mouths of the tubes are reddish, and in the case of other tube-bearing fungi experiment with caution.

(6) Avoid fungi having clay-colored gills and a spider web or woolly ring on the stalk.

(7) In case of doubt discard the plant.

Mushrooms which May be Gathered.

The foregoing rules are given as a warning against comparatively few plants; the edible mushrooms are more numerous, and those that may be gathered are as followed:—

All the puff balls and coral fungi; any of the hedge hog or spiny fungi and the morels; also any mushroom whose gills become brown; mushrooms having reddish or orange milk; all mushrooms that melt down into an inky liquid when mature; many mushrooms with white gills, but care must be taken to be absolutely certain that they have no poison cup or volva.

RECIPES FOR USING MUSHROOMS.

1. To Can Mushrooms.

Sometimes more mushrooms are gathered at one time than can be used immediately. These cannot be kept like vegetables, but can be preserved by canning.

Peel, dry, wash thoroughly and boil in well salted water until done. The very tender kinds, such as ink caps, require little boiling. The tougher kinds may be boiled for an hour. Morels and puff balls should be cut into small pieces. Be sure to salt abundantly and have boiling hot when put into the glass jars, then seal as for any canned fruit or vegetable.—*Benedict.*

2. Mushrooms may be Dried.

Take those neither very young nor very old. Remove the butts. Then slice and string or skewer lightly and expose to a current of warm, dry air. A warm oven with the door open is a good place. When quite dry and shrivelled pack in tins with spice at the top and bottom. When wanted for use soak in tepid water for some hours, then cook.—*Hay.*

3. Soup.

1 quart mushrooms
3 pints water
½ pint milk
1 tablespoon flour
2 tablespoons butter
1 dessertspoon salt
1 teaspoon pepper.

Carefully clean the mushrooms. Put in a covered boiler with water, and boil slowly for an hour. Put through a colander. Reject that which does not pass through. Add milk thickened with flour, butter, salt and pepper. Bring to a boil. Serve. This makes two quarts of soup.—*McIlvaine.*

4. *Stewed Mushrooms.*

Cut into small pieces of even size, place in a covered saucepan. To each pint add two tablespoons of butter. There will be enough water from washing to make liquor. Stew slowly twenty minutes; season to taste with pepper and salt. May be served either alone or on toast.

The tougher kinds should be soaked in warm water half an hour before stewing. Parsley, nutmeg or beef gravy may be added.

5. *Fried Mushrooms.*

1 pint mushroom caps
1 teaspoon salt
teaspoon black pepper
2 tablespoons butter.

Put the mushrooms into boiling hot butter and fry for 10 minutes. Add a little milk or cream thickened with flour. May be served alone or on toast.

6. *Baked Mushrooms.*

Wash, place the caps in a tightly covered dish or pan, after dipping them in bread crumbs. Arrange in layers with a small piece of butter on each mushroom, with a little pepper and salt. Bake from 20 to 30 minutes until done. Serve on toast. Cheese grated on each layer makes a desirable addition. *McIlvaine.*

7. *Scalloped Mushrooms.*

Put in a baking dish layers of cold cooked meat, diced or sliced. (Stewed until tender.) Moisten with gravy or sauce. Alternate with stewed mushrooms. Cover with buttered biscuit or bread crumbs. Bake about 20 minutes.

8. *Salads.*

Many kinds of mushrooms make good salads. The shaggy mane, ink cap and many of the coral fungi are good raw. The tougher kinds should be first stewed, then drained and cooled.

Mix with mayonnaise dressing or make a dressing to taste of oil, vinegar, salt and pepper. Serve on lettuce.

9. *Fresh Mushroom Sauce.*

2 tablespoons butter
2 cups freshly prepared mushrooms
salt and pepper.

Put butter in a granite or porcelain lined saucepan. When hot add mushrooms. Cover closely and cook briskly two or three minutes. Season to taste with salt and pepper, and serve with broiled beefsteak, birds or sweetbreads. *Mr. E. B. Irving.*

Literature.

Those who are interested in mushrooms can obtain further information on them from the following books:

McIlvaine, Chas. ..... One Thousand American Fungi.
Hard, M. E. ..... Mushrooms, Edible and Otherwise
Atkinson, Geo. F. ..... Mushrooms, Edible, Poisonous, Etc.
Marshall, Nina L. ..... The Mushroom Book.
Gibson, Hamilton ..... Our Edible Fungi.
Murrill, W. A. ..... Edible and Poisonous Mushrooms.

GROWING MUSHROOMS.

Many people would like to grow mushrooms for home use or for a small local market. For such limited production elaborate mushroom houses are not necessary.

Mushrooms may be grown any place where conditions of temperature and moisture are favourable. A shed, cellar, cave or a vacant space in the greenhouse may be utilized to advantage for this purpose. The most essential factor, perhaps, is that of temperature. The proper temperature ranges from 53° to 60° Fahrenheit with the best from 55° to 58°. Any severe change in temperature will retard the growth or may do more serious harm, even to destroying the crop. High temperatures are especially harmful as diseases then develop. From this it is evident that mushrooms cannot be readily grown in summer nor as an outdoor crop. With artificial heat they may be grown almost any place in the winter.

The best material upon which to grow mushrooms is a compost made from horse manure. The manure should contain considerable straw, but not too much long, coarse material. The best material will be quite damp, containing a large amount of urine. Manure containing shavings or sawdust is not so good. Garden refuse should not be used. Manure from veterinary hospitals should be discarded, as it contains quantities of disinfectants which will prevent the growth of the mushrooms.

A wagon load of manure is sufficient to make a bed containing 80 or 90 square feet, which should yield at least a hundred pounds of mushrooms.

Preparing the Compost.

The fresh manure should be well shaken to rid it of coarse straw and to mix it thoroughly. It should then be placed in a pile about three feet deep and kept moist and allowed to heat or ferment, taking care that it does not get so hot and dry as to burn—that is to get white and dry inside. To prevent burning the pile should be forked over every three or four days and watered if necessary. The manure should feel damp to the hand but should not drip water when squeezed or pressed. It is best to keep the pile under cover so that it will not be leached by rain. Furthermore, it should not be allowed to freeze. The best time to ferment the manure is September or October.

While fermenting, the manure will attain a temperature of 100° to 150° Fahrenheit, but after a week should begin to become gradually cooler, and when it has cooled down to 70° will be ready to use. If the fermentation is thoroughly done the manure will by this time have lost all objectionable odour; will have an odour suggesting mushrooms; will have a slightly greasy feel and the straw will have a uniform dark brown colour and the droppings will appear as brown powder.

Making the Beds.

For growing mushrooms in small quantities beds may be made directly on a cellar floor or under the greenhouse benches. The boxes a foot deep and as large as desired may be made with sides of board or plank, a bottom is not necessary.

Place in the bottom of the box four or five inches of manure and pack it down tightly. Then add two inches of rich garden soil. Pack down. Add another layer of manure and another of soil and continue until the box is full, taking care to keep the compost firmly packed.

A very simple method of preparing the beds is as follows: Mix thoroughly the manure with good garden soil, using three bushels of manure to one bushel of soil. Place the compost in the boxes prepared and pack firmly by tamping with a brick.

After the beds are prepared they will probably heat to some extent but will again cool. After the temperature has cooled down to 70° they may be planted.

Planting or Spawning.

We have not yet been successful in growing mushrooms from spores. In planting mushrooms we use spawn.

What Spawn Is.

Spawn is dry compost containing the mycelium of mushrooms. There are two forms of spawn, brick spawn, in which the compost is compressed into blocks 8½ inches by 5½ inches by 1 to 1½ inches, and flake spawn, in which the compost is in the form of loose masses. Brick spawn generally comes from England or the United States, while flake spawn comes from France. It is generally conceded that brick spawn is the best, as it does not dry out and deteriorate to such a great extent as does flake spawn.

Mushroom spawn can generally be obtained from any of the larger seed firms. After the bed has cooled down to 70°, the spawn may be planted.

The bricks are broken into pieces about 2 inches square. A hole about 2 inches deep is then made in the bed and a piece of the spawn pressed firmly down, then thoroughly covered with the compost which is then firmly packed. A piece of spawn should be planted to every square foot of the bed. Now cover the bed with about four inches of clean straw and, if convenient, with a piece of old carpet.

After ten or twelve days the bed should be examined. By this time the spawn should have begun to grow, forming fine white threads all through the bed. The straw should be removed and a layer of garden soil 1 or 2 inches thick should be added to the bed and firmly but gently packed down. Then replace the straw and carpet.

Care should be taken to keep the bed moist but not too wet. It is better to apply water with a watering pot every few days rather than drench the bed with a hose or buckets of water.

After about 10 days mushrooms should begin to appear and the straw and carpet should then be removed. The bed should continue to bear for three months or more, giving successive crops of mushrooms every few days. A pound to the square foot is a good yield, although 2 pounds may sometime be obtained.

When no more mushrooms appear the beds should be thoroughly cleaned out, all the compost being removed. It will also be well to scrub the bed thoroughly with formalin before attempting to grow mushrooms again. The compost cannot be used again for growing mushrooms, but it will make excellent fertilizer for the garden, and is also very good for potting plants.

Gathering the Mushrooms.

It is best to gather the mushrooms just before the veil breaks. They are then as heavy as they will become. If left until the veil breaks they begin to lose weight and also the gills rapidly become brown and when cooked do not present the best appearance, as well as giving the liquor a brown colour.

When the mushrooms appear singly or in small clusters the best way to gather them is as follows: Take hold of the stalk just under the cap and give the mushroom a slight twist. This will break it loose from the spawn and it can then be lifted up without disturbing the bed. The compost should be pressed firmly into the cavity formed. The soiled end of the stalk should be cut off and discarded but not allowed to remain on the bed.

If the mushrooms come up in large clusters, the clusters should be cut off close to the soil and placed in a receptacle. The stubs of the stalks should then be carefully removed and the cavity formed filled in with compost.

The foregoing account of mushroom growing applies particularly to growing them in small quantities for the home or limited local use. There are a number of good books and bulletins which can be secured, dealing with mushroom growing on a commercial scale.

Literature.

Atkinson, Geo. F., and Shore, R. Mushroom Growing for Amateurs.—N. Y. Coll., Agr. Bul. 227.

Duggar, B. M. The Cultivation of Mushrooms.—U. S. Dept. of Agr., Farmers' Bul. 204.

Duggar, B. M.—The Principles of Mushroom Growing and Spawn Making.—U. S. Dept. Agr. Bur., Pl. Ind., Bul. 85.

Duggar, B. M.—Mushroom Growing. Orange Judd Co.

Falconer, W.—Mushrooms: How to Grow Them.

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